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Application No. 09/755,282

REMARKS

Examiner James Mitchell is thanked for carefully examining and reviewing the subject patent application. The claims and the specifications have been amended in accordance with the Examiner's kind suggestions, and all claims are now believed to be in condition for allowance. The language of independent structure Claim 1 has been amendment to better represent the Applicant's claimed invention.

CLAIM REJECTIONS 35 U.S.C. 102

Reconsideration of the rejection of Claims 34 and 38 under 35 U.S.C. 102(b), as being anticipated by Yoshioka, (U.S. 5,357,136) hereafter referred to as Yoshioka, is requested, based on the following.

(Reference paragraphs 1, 2 and 3, Paper No. 8)

In reviewing Yoshioka, the Applicant's interlocking grid structures or array, of passivating material and conducting material for the bond pad structures seems not to be disclosed or suggested, either in the Yoshioka's specifications, or in the claims. Furthermore, there are differences in the Applicant's

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claimed invention, that are not anticipated by, nor the same, as the Yoshioka invention. In the Applicant's claimed invention, in the specifications and in Claims 34 and 38, the claimed invention provides details of the conducting bond pad formed by the interlocking grid structure or array comprised of aluminum.

Please note in Yoshioka's Col.3, lines 60 to 65, "Preferably, a plurality of such openings 7 are provided", which appear to be electrical contact vias, not interlocking grid structures, as claimed in the Applicant's claimed invention. Applicant's claimed structure does contain significant differences from Yoshioka, and furthermore, the Applicant's claimed invention for a structural patent, depicts a very different structure and process than the method and structure taught by Yoshioka.

Please note, that the Applicant's claimed invention Figures 1, 2, 3 and 4 are unique; and are not found in Yoshioka's figures, nor are there similarities.

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In reference to the Applicant's Claim 38, "The bond pad structure of Claim 34, wherein said conducting bond pad is formed of aluminum", please see the Applicant's claimed invention in Figs. 1, 2, 3 and 4 showing a "jagged" bond pad surface and interlocking grid structure, that is very different than Yoshioka's Figure 1, pad structure #30, referred to in Paper No. 8, "for subsequent formed bonds".

CLAIM REJECTIONS 35 U.S.C. 103

Reconsideration of the rejection of Claims 35, under 35 U.S.C. 103(a), as being unpatentable over Yoshioka as applied to Claim 34, in combination with Pozder et al (US 2001/0051426 A1), hereafter referred to as Yoshioka, is requested, in light of the following. (Reference paragraphs 4, 5, 6, and 7, Paper No. 8)

Yoshioka's method patent, in combination with Pozder, fails to disclose nor suggest Applicant's non-obvious structure, found in the Applicant's Claim 35, for conducting bond pads formed of copper, dependent on patentable Claim 34. Pozder discloses an aluminum capping layer and, in the background section,

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discourages the application of copper bonding pads,
perhaps for lack of process understanding.

Reconsideration of the rejection of Claims 36,
under 35 U.S.C. 103(a), as being unpatentable over
Yoshicka, as applied to Claim 34, and further in
combination with Camilletti (US 5,693,564), hereafter
referred to as Camilletti, is requested, in light of the
following.

(Reference paragraphs 4, 8, 9, and 10, Paper No. 8)

Yoshicka's method patent, in combination with
Camilletti, fails to disclose nor suggest Applicant's
non-obvious structure, found in the Applicant's Claim
36, for conducting bond pads, formed of aluminum,
dependent on patentable Claim 34. In Camilletti, there
are no comparable bond pad structures disclosed that are
similar to that of the Applicant's claimed invention.
Some elements of semiconductor technology naturally
overlap in invention claims, and are common elements.
However, in the Applicant's Claims 34 and 36, the
passivating layer is selected from the group consisting
of SiO₂, SiN_x, and polyimide.

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Camilletti's disclosure teaches the use of silicon oxide as a passivating layer, as the Examiner points out. In the Applicant's claimed invention, the key application is forming an interlocking grid structure or grid array for bond pad formation. In contrast, Camilletti's invention teaches a processing method of using hydrogen silsequioxane resins to better connect and anchor conventional bond pads.

Furthermore, agree with the Examiner that Yoshioka's invention does not show the passivating layer consisting of silicon oxide. Furthermore, the Applicant's claimed interlocking grid array, of passivating material and conducting material for the bond pad structures seems not to be taught, either in the Yoshioka specifications, or in the claims. The Applicant's claimed invention is not obvious and is not suggested by the cited references.

Reconsideration of the rejection of Claims 37 under 35 U.S.C. 103(a), as being unpatentable over Yoshioka, as applied to Claim 34, is requested, in light of the following.

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(Reference paragraphs 4, 11, 12, 13 and 14, Paper No. 8)

As stated earlier, in Yoshioka's Col.3, lines 60 to 65, "Preferably, a plurality of such openings 7 are provided", which are electrical contact vias, and fails to disclose or suggest an interlocking grid array, as claimed by the Applicant. Applicant's claimed structure is not disclosed nor suggested by Yoshioka. The Applicant's Figures 1, 2, 3 and 4 are unique; and are not obvious. Politely disagree with the Examiner statement that, "In any case, it would have been an obvious matter of design choice...", as to the exact dimensions of the interlocking grid for the bond pad structure, as precisely disclosed and taught by the Applicant's claimed invention, in structure Claim 37.

Also noteworthy, what is not found in the Yoshioka's method claims, is that taught by Yoshioka's specifications, namely, Col.3, lines 60 to 65, "Preferably, a plurality of such openings 7 are provided"; but, there is no interlocking grid pattern as in the Applicant's Figs. 1-4, compare with Yoshioka's Figure 1.

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Reconsideration of the rejection of Claims 39 under 35 U.S.C. 103(a), as being unpatentable over Yoshioka, as applied to Claim 34, and further in combination with Saran (U.S. 6,232,662) hereafter referred to as Saran, is requested, in light of the following.

(Reference paragraphs 4, 15, 16, and 17, Paper No. 8)

In reviewing both Yoshioka and Saran, both fail to disclose or suggest the Applicant's non-obvious structure of bond pad structures disclosed. Some elements of semiconductor technology overlap, of course, in invention claims, and are common elements. However, in the Applicant's Claims 39 and 34, the bond pad barrier layer is formed of TaN. Diffusion barrier layers are common practice in the Industry. Furthermore, in the Applicant's claimed invention, the key application is forming an interlocking grid array for bond pad formation.

In conclusion, for state-of-the-art advanced applications in silicon bonding technology, the applicant's claimed invention is believed to be patentable over Prior Art references, Yoshioka, Pozder,

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Camilletti, Sarah, because there seems to be insufficient basis for concluding that the modification of Prior Art disclosures, would have been obvious to one skilled in the art. That is to say, there must be something in the prior art or line of reasoning to suggest that the combination of these various references is desirable. We believe that there is no such basis for the combination.

Prior references fail to disclose or suggest the Applicant's non-obvious structure of an interlocking grid structure or pattern:

- (a) as shown in the Applicant's claimed invention Figs. 1 through 5;
- (b) the top surface of the grid directly interacts with the bonding metallurgy;
- (c) the interlocking grid pattern does not teach a structure of forming a conducting via, since via resistant would increase by this structure;
- (d) the Applicant's Claim 34, patentable independent claim and patentable dependent Claim 37, set forth very specific limitations;

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- (e) the Examiner cited Camilletti for a passivating layer "not applicability in a bond pad";
- (f) the cited prior art sketches do not teach the Applicant's claimed invention structures;
- (g) the Applicant's claimed invention teaches that Claim 35, "conducting bond pads are formed of copper", while Pozder fails to disclose a reliable method or structure for processing copper bond pads with reference to (0004).

(Reference paragraph 18, Paper No. 8)

FINAL REMARKS

The Examiner James Mitchell is again thanked for carefully examining and reviewing the subject patent application. The specifications and claims have been reviewed in accordance with all the Examiner's kind suggestions, and after amending the specifications and claims in accordance with the Examiner's helpful suggestions, all claims are now believed to be in condition for allowance.

All rejected claims 34-39 are now believed to be in allowable condition, and allowance is so requested.

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It is requested that should there be any problems
with this Amendment, please call the undersigned
Attorney at (845) 452-5863.

Respectfully submitted,



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Attached hereto is a marked-up version of the
changes made to the specifications and the claims by the
current Amendment. The attached page is captioned,
"Version With Markings To Show Changes Made."

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"Version With Markings To Show Changes Made"

34. (AMENDED) A bond pad structure, comprising:
- a semiconductor substrate;
 - a plurality of conductive bond pads, comprising
 - interlocking grid structures, formed over said semiconductor substrate;
 - a passivating layer formed over said bond pads, having multiple openings to each said bond pads;
 - a barrier layer formed over said passivating layer and in said openings;
 - a conducting pad formed over each said bond pad and over said barrier layer, whereby an upper surface of said conductive pad provides improved adhesion for subsequently formed bonds.